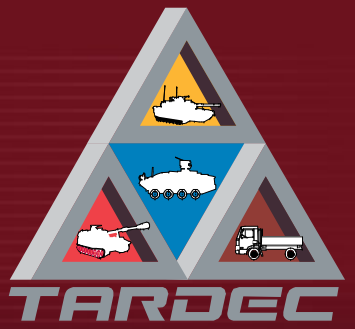

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Proposed FY09 ATO-D: Improved Mobility and Operational Performance through Autonomous Technologies (IMOPAT)

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D.TAR.2009.04 Improved Mobility and Operational Performance through Autonomous Technologies (IMOPAT)

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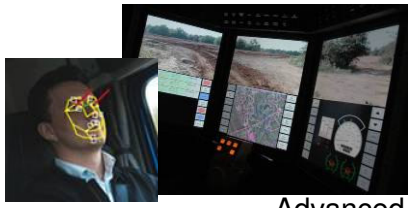
360/90 Day/Night
Near-field Sensor Coverage



Soldier Monitoring
& State

Advanced
Crew Stations

Integration Platform
With IV System

Integrate, Enhance, Demonstrate
360 LSA/Assist-Mob/Soldier Monitor & State
to Maximize Soldier-System
360 LSA and Mobility Capabilities
(Secure Mobility)

Schedule & Cost

MILESTONES	FY09	FY10	FY11	FY12
M&S and Field Experiments				
Local 360 SA		4	5	6
- Task Analysis				
- Integrate Detection Algorithms				
- Integrate Digital Recording				
- Integrate Dismount System				
Improved Mobility		4	5	6
- Soldier Task Balancing				
- Assisted Mobility				
Solider Monitor/State CS System		4	5	6
- Sensor Integration				
- Algorithm Integration				
- Integration Technique				
Total (TARDEC, NVESD, ARL-HRED, NSRDEC)				

Purpose

Enable indirect vision (IV) based Soldier–systems (manned/unmanned/Soldier) to move quickly and safely while maintaining 360 local situational awareness (LSA) to enhance operational performance.

Product

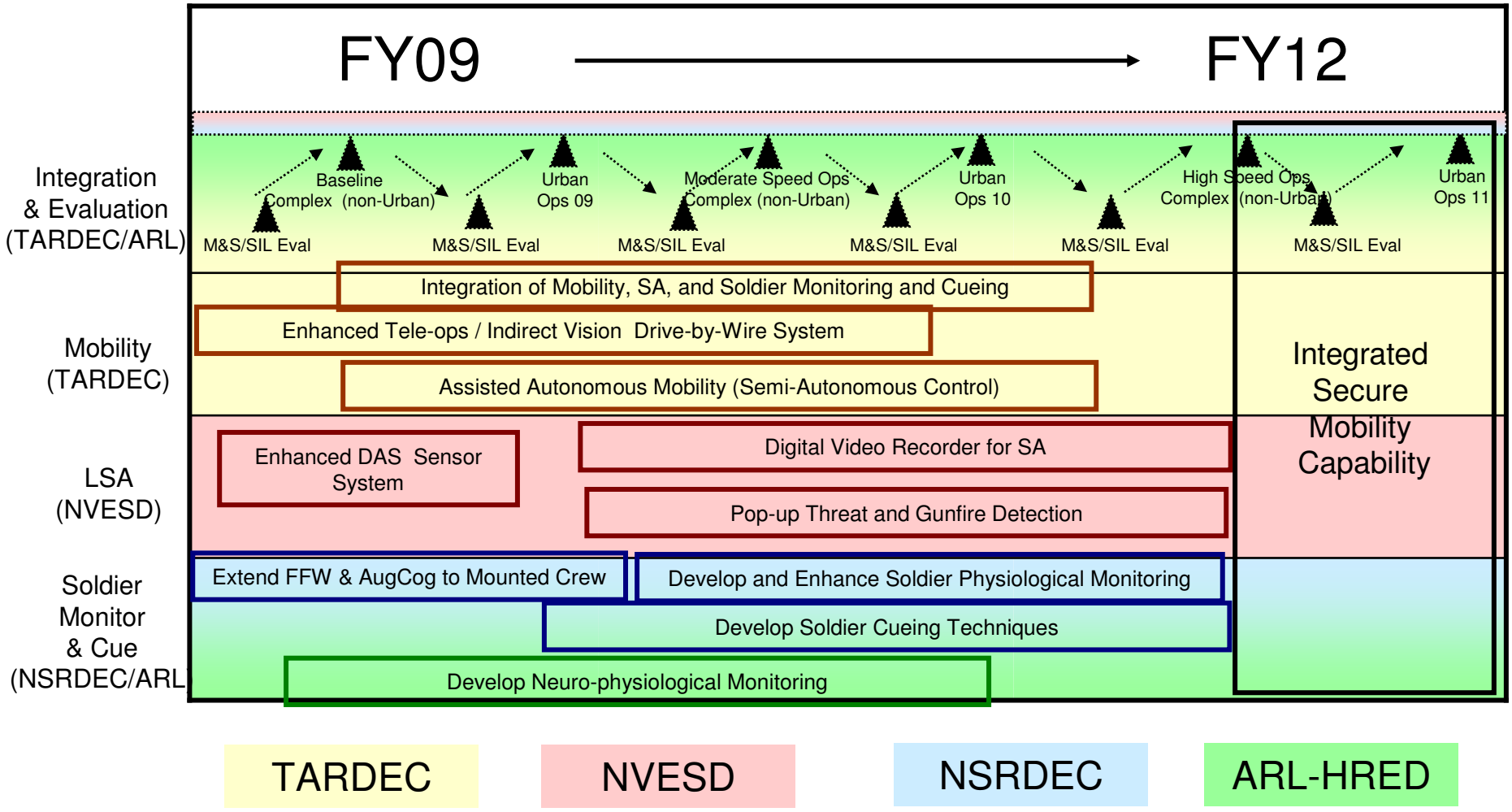
- *Advanced Crew Stations integrated with 360/90 Day/Night LSA, Assisted Mobility, and Soldier Monitoring / State technologies to improve Soldier performance*
- *Quantitative understanding (performance levels) of future indirect vision operations for the movement and security of Soldier-systems at a platoon and below level when utilizing:*
  - *Assisted mobility*
  - *LSA system with aided target cueing*
  - *Digital video recording of 360/90 with intelligent tagging*
  - *Soldier monitoring and state based crew station (CS) design*

Payoff

- *Improvement in Vehicle & Soldier Survivability, Vehicle Lethality/Self-Defense & Control along with Greater Survivability/Lethality for Dismount Soldiers*
- *Two Mounted Soldier ability to maintain 360 LSA with IV*
- *One Mounted Soldier ability to move vehicle (manned or unmanned) quickly and safely with IV*
- *Data and Information to feed programmatic decisions*
- *Risk reduction for FCS*

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Development Plan and Progression



Partners / Responsibilities

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TARDEC

- Develop Enhanced Indirect Vision Drive / Tele-operation Systems
- Develop Assisted Autonomy Systems
- Develop Warfighter Machine Interfaces
- Integrate and Evaluate
  - Vehicle LSA Systems (NVESD)
  - Soldier Monitoring & State Classification Systems (NSRDEC/ARL-HRED)
  - Assisted Mobility (Other TARDEC Programs)
  - Dismount LSA Systems (NSRDEC)
- Perform SIL and Vehicle/Field Experiments

ARL-HRED

- Define and Develop Experimentation Plans
- Work with TARDEC on Indirect Vision Drive and Assisted Autonomy Systems
- Provide HFE Support for Systems Development and Integration
- Develop Information Flow Requirements and Algorithms for Mobility and LSA
- Work with NSRDEC on Soldier Monitoring and Workload Management Systems

NVESD

- Enhance DAS Sensor Systems / Threat Detection Algorithms
  - Pop-Up Targeting and Gun-Fire Detection (before/during/after shot)
- Develop Digital Vehicle LSA Recording and Cueing System

NSRDEC

- Enhance and Transition Mid-Maturity Dismount Soldier Monitoring Systems from Augmented Cognition Program
- Develop/Enhance Low-Maturity Soldier Monitoring System
- Work with ARL-HRED on Soldier Monitoring Systems
- Develop Dismount LSA System

Urban Engineering Evaluation Test Scenario

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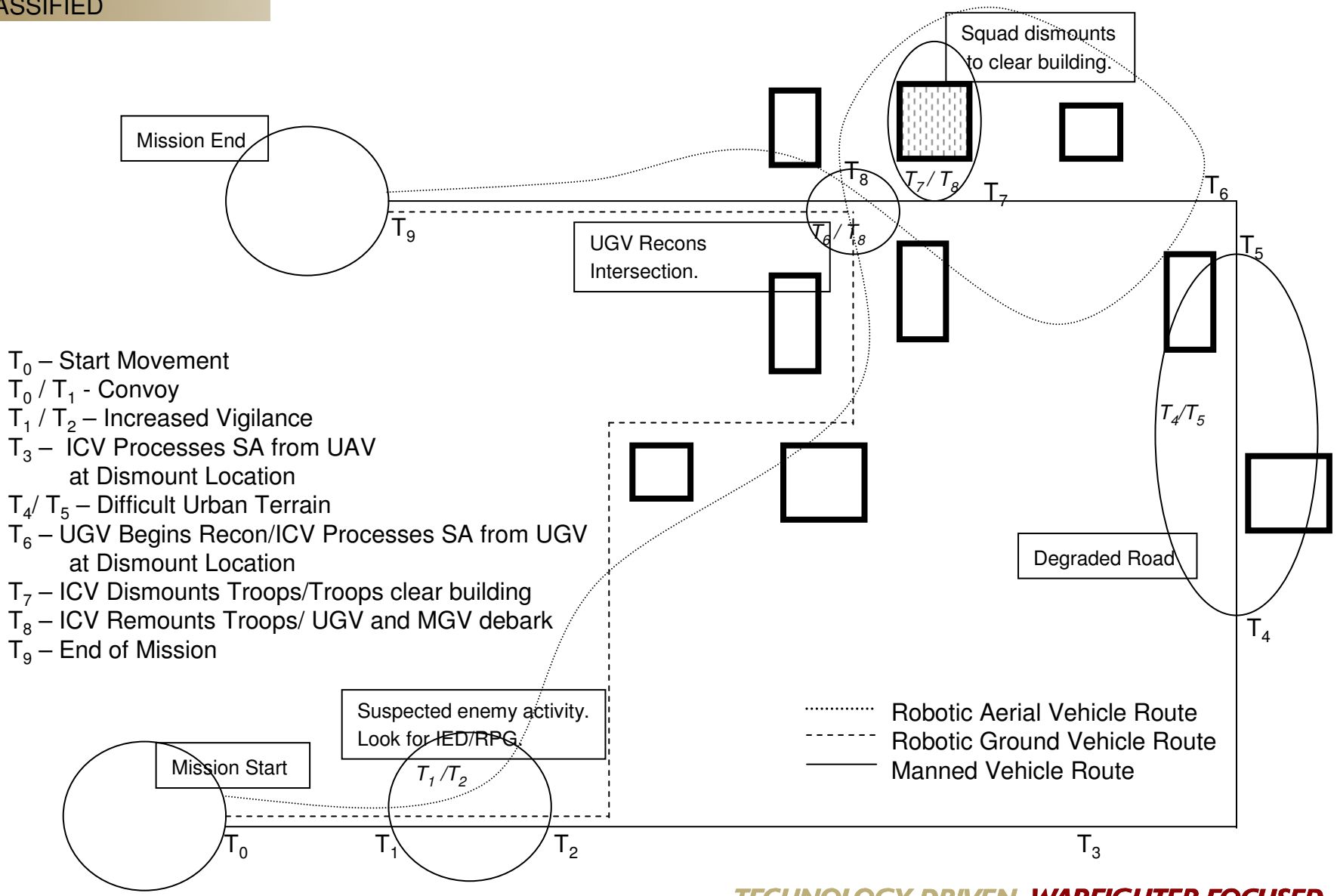

Evolution of TARDEC's Intelligent Ground Systems Programs

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Testbed Platforms

Manned Platform

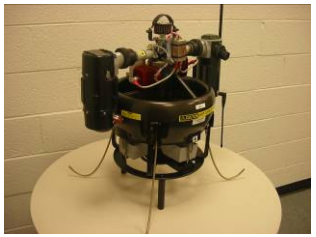
Crew-integration and Automation Testbed (CAT)

Unmanned Platforms

Crusher

eXperimental Unmanned Vehicle (XUV)

Talon



gMAV

CAT Crewstations

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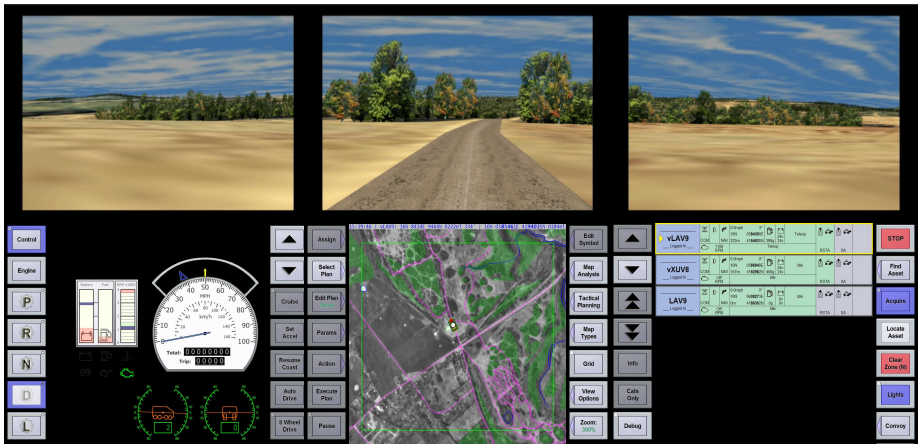
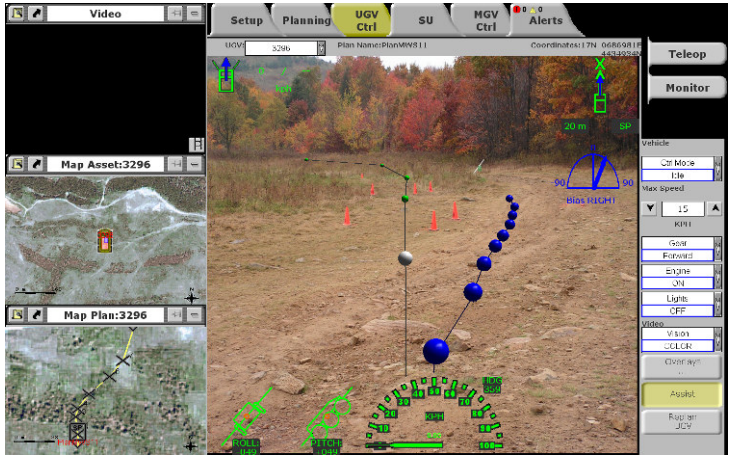
Common Crew Surrogate



Warfighter Machine Interfaces

Mission Module Workstation



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Modeling and Simulation System Integration Labs

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Motion Based Simulation

System Integration Lab

Technology Feeder HW Architecture

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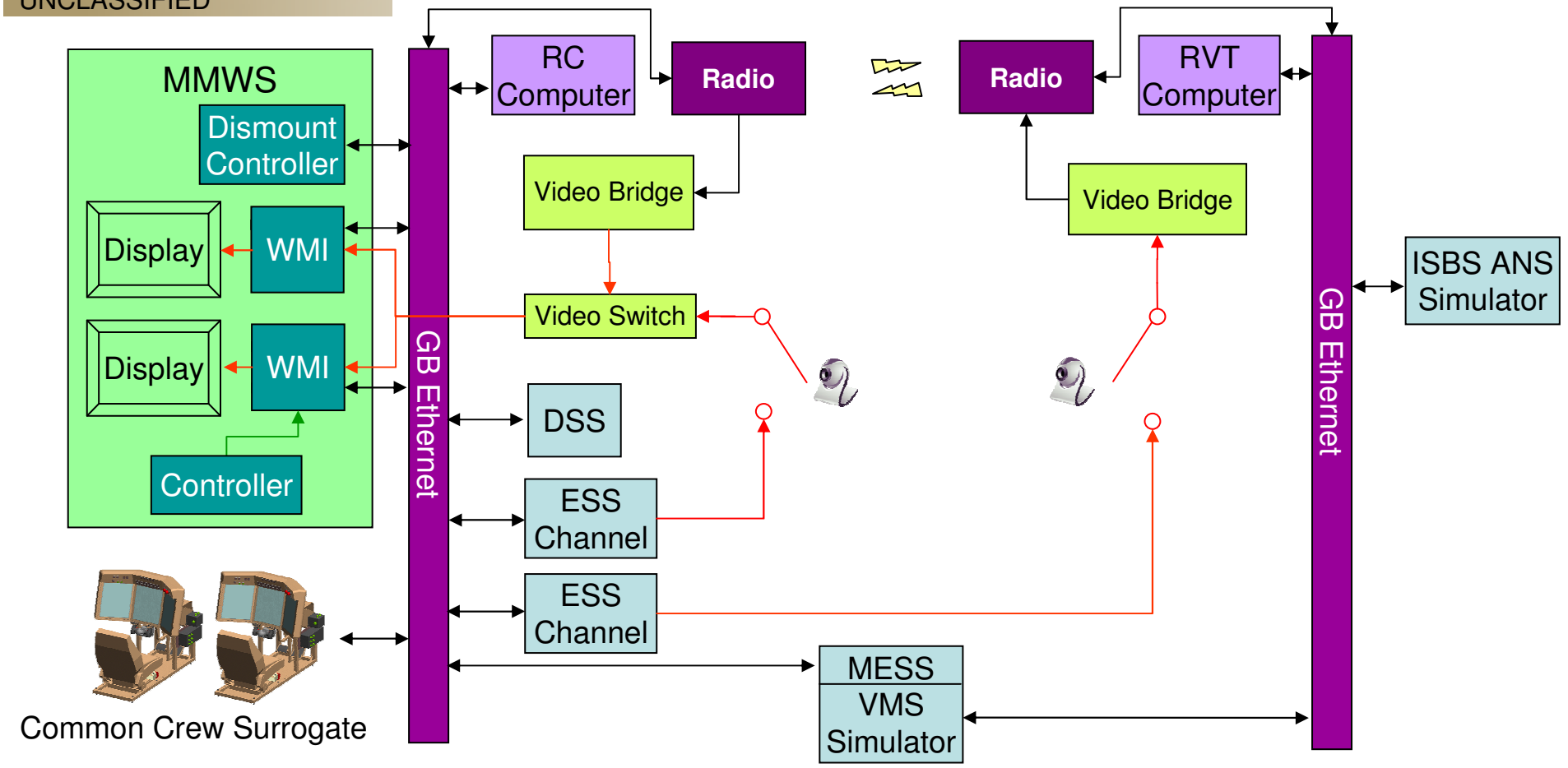


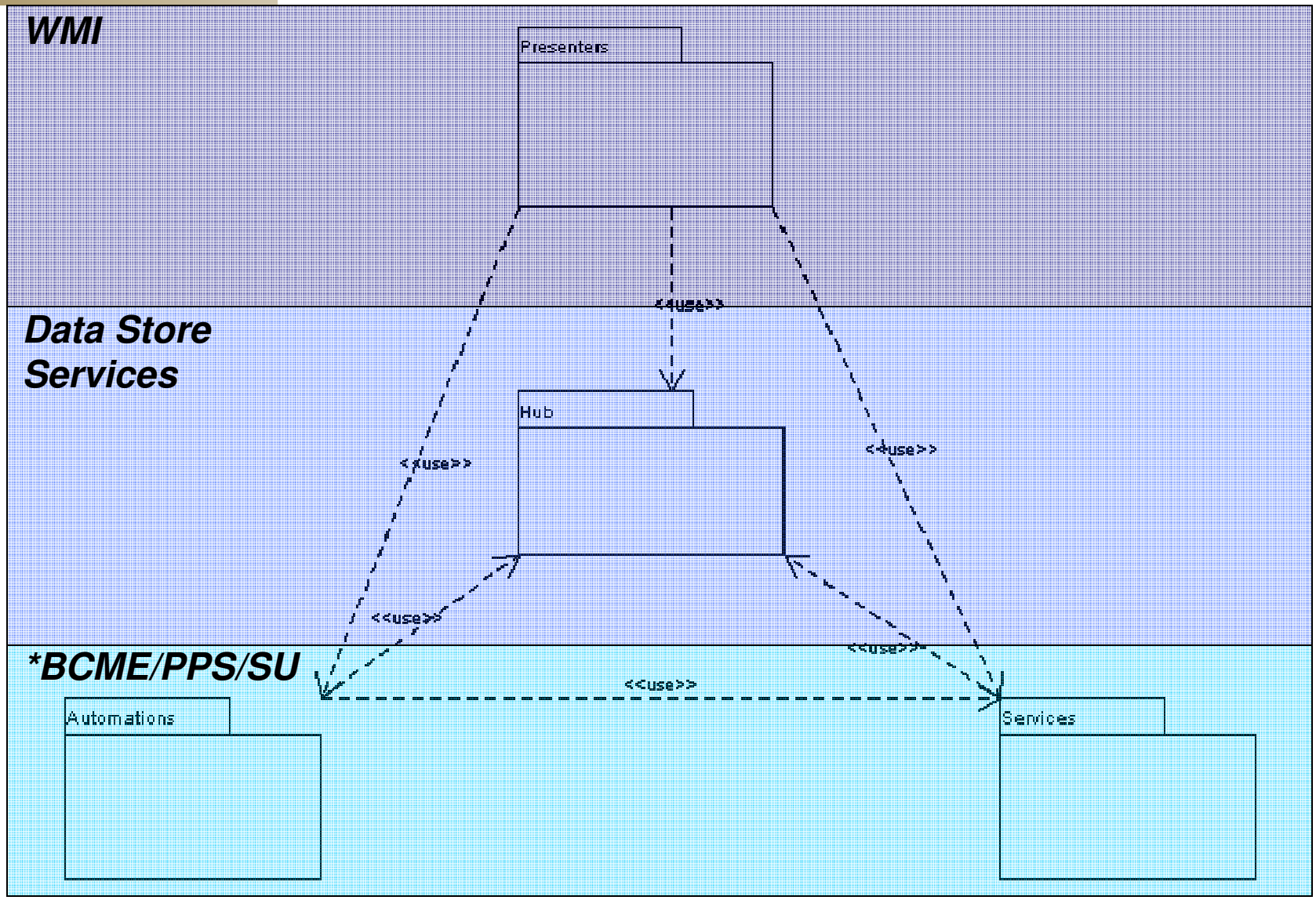
= Video Equipment
= Shuttle PC
= cPCI SBC
= Network
= Other

= Video
= TCP/IP
= USB
= Wireless

WMI = Warfighter Machine Interface
MMWS = Mission Module Workstation
ISBS = Intelligent System Behavior Simulator
DSS = Decision Support System
ESS = Embedded Simulation System

MESS = Master Embedded Simulation System
ICS = Integrated Computer System
VTI = Vetronics Technology Integration
ANS = Autonomous Navigation System
VMS = Vehicle Management System

Technology Feeder
SW Service Architecture



*surrogate

Technology Feeder
SW Service Architecture

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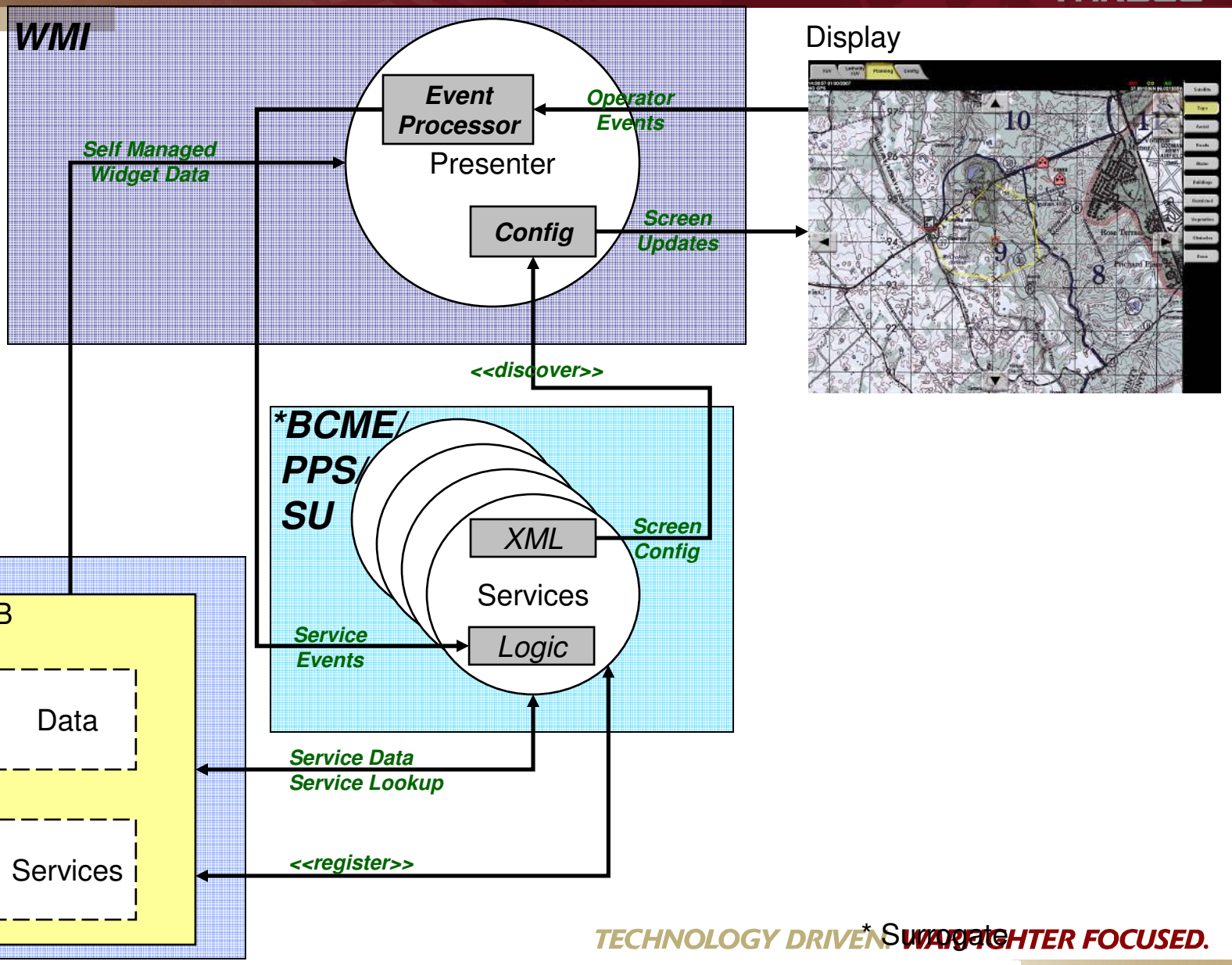
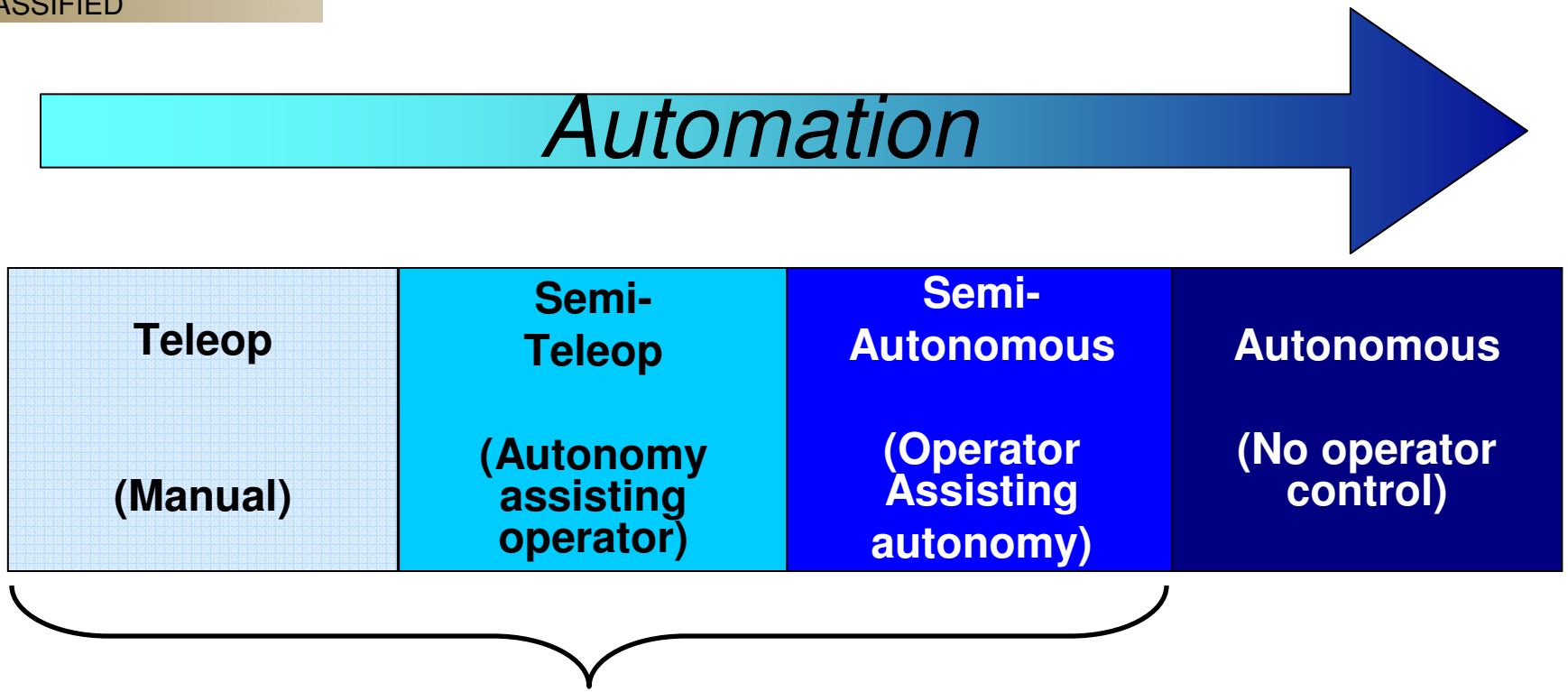


* Surrogate

Technology Feeders
Mobility Autonomy



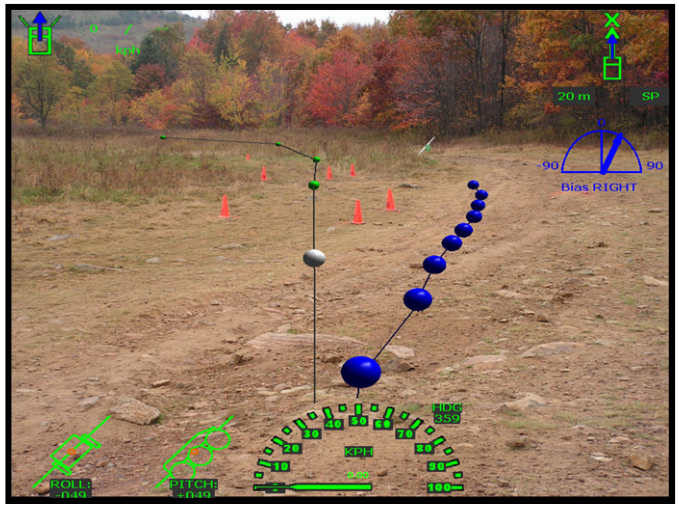
Focus: Reduce operator intervention time and workload through:

- Increased SA/SU
- Technology Integration
- Advanced WMI
- *Leverage as much as possible from FCS to support RC objectives*

Technology Feeders
Mobility Autonomy

FY 07 (RC ATO)

- Bias
- Speed Adjust
- Obstacle Overlays
- Apriori Overlays



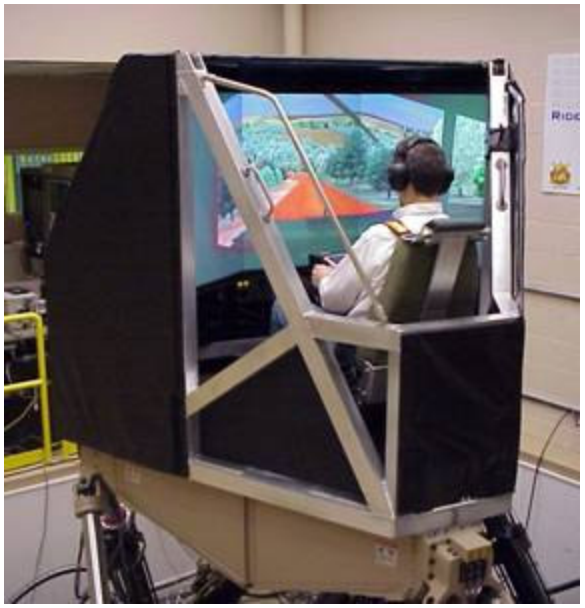
FY 08 (RC ATO)

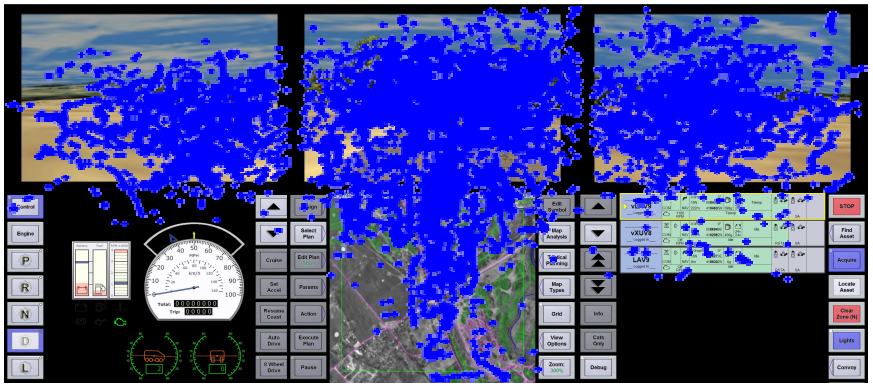
- Aggressiveness
- Steerable Waypoint
- Confidence
- Long Range
- Safety Push / Clear Map
- Obstacles Map Aid
- Wonder Women

Eye Tracking Pilot Experiment

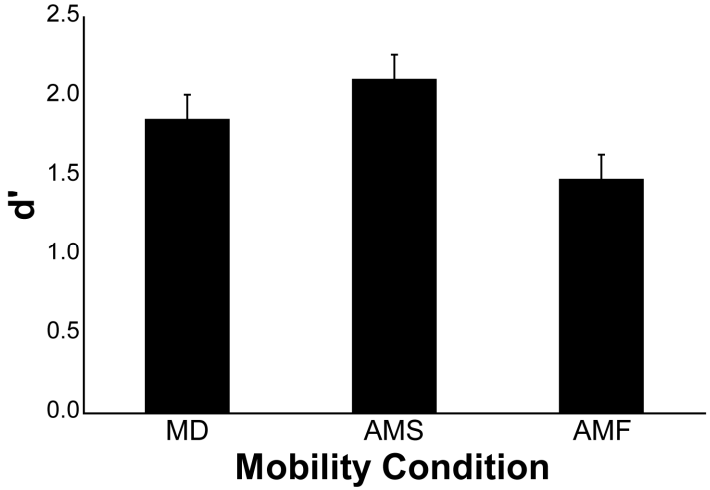
2006 Pilot Experiment (TARDEC)

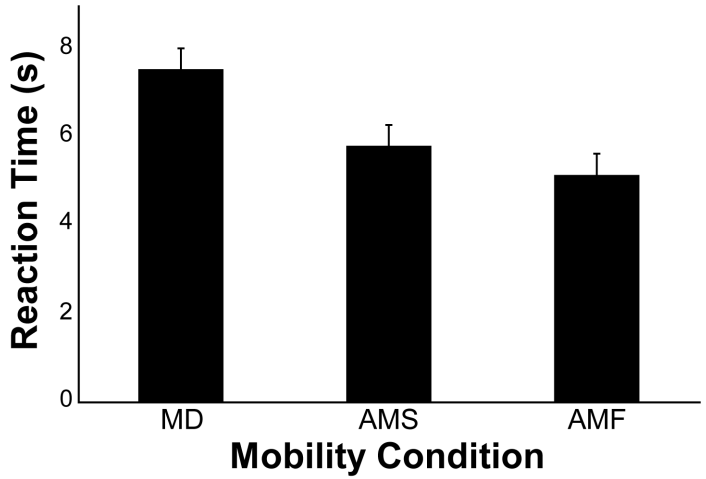
Tracked participants eye-movements and performance in full 6-DOF motion base simulator while executing supervisory control.





Local Area 360 SA – Identification Accuracy and Response Time





Planning on Move During Convoy Ops

Condition	Plan on Move (%)
Auto-Pilot 25 mph	49.5
Auto-Pilot 15 mph	54.0
Indirect Vision Manual 15 mph	18.0